SAFETY CODE No. 7

for all
Underground Mines

(Except Coal Mines)

Promulgated
October 15, 1955

SAFETY CODE No. 7
Relating to
Underground Mining Operations
(Except Coal Mines)
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SAFETY CODE NO. 7
Underground Mining Operations
(Except Coal Mines)

RULES promulgated by the Commissioner of Labor of the State of Arkansas pursuant to the provisions of Act 161 of 1937.

7-1. APPLICATION. These rules shall apply to all underground mining operations, except Coal Mines.

7-2. DEFINITIONS.
7-2.1. "Mine" means underground workings for the extraction of minerals and all shafts and other openings leading thereto, and includes all buildings and equipment, above or below the surface of the ground, used in connection with such workings. Workings that are adjacent to each other and under the same management and that are administered as distinct units shall each be considered a separate mine.
7-2.2. "Underground," means below or beyond the entrance to the shaft or adit.
7-2.3. "Excavation," means all parts of a mine underground whether completed, abandoned or in the process of being excavated.
7-2.4. "Commissioner," means the Commissioner of Labor of the State of Arkansas or his duly authorized representative.
7-2.5. "Hereafter," means after Effective Date.
7-2.6. "Heretofore," means before Effective Date.
7-2.7. "Explosive," means any mixture or chemical compound that is capable of producing an explosion by its own energy. This includes black powder, dynamite, nitroglycerine compounds, fulminate, or explosive substance having explosive power equal to or greater than black powder.
7-2.8. "Detonators," means any blasting cap, electric blasting cap, delay blasting cap and detonating fuse.
7-2.9. "Timbering," means any and all structural supports of the walls or roof of an excavation.
7-2.10. "Railing," means a dressed two inch by four inch (2x4) wooden rail or its equivalent in strength securely installed not less than three and one-half feet nor more than four feet above the walking level with supports spaced not more than eight feet apart and provided with a midrail.
7-2.11. “Approved," means approved by the Commissioner, unless otherwise in these rules provided.
7-2.12. “Acceptable," means accepted or authorized by the Commissioner.
7-2.13. “Potentially gassy atmosphere,” means one in which there has been or in which there may be expected to be found a concentration of flammable gas in excess of one per cent by volume.
7-2.14. "Magazine," means any building or other structure other than an explosive factory, used to store explosives.

7-3. GENERAL.
7-3.1. SUPERINTENDENT. Every operating mine shall have a superintendent who shall personally be in charge of and responsible for the work therein.
7-3.2. OBSERVANCE OF RULES. Every employee and every person having supervision over employees shall observe all rules that immediately concern or affect his conduct.
7-3.3. RESPONSIBILITY OF EMPLOYER. The owner, the operator, and the superintendent shall use every reasonable precaution to provide for the safety of the workmen in a mine, whether provided for in these rules or not, and it shall be the duty of such owner, operator, and superintendent to carry out the provisions of these rules by providing the safety devices, types of construction, materials, methods, and procedures required by these rules.
7-3.4. MAINTENANCE OF EQUIPMENT, etc. All machinery, equipment, appliances, materials, structures and places shall at all times be maintained in a safe condition and in good repair and shall be periodically inspected for defects. Every person observing any such defects shall immediately advise the mine foreman, the superintendent, or owner thereof.
7-3.5. INSPECTION AND MAINTENANCE--EXCAVATIONS. The roof of every excavation that is supported only by its walls or by pillars shall be maintained free of any loose rock. Periodic inspection shall be made for such loose particles by an authorized person.

During the operation of dislodging such particles the space immediately beneath shall be closed to passage.

The worker shall inspect and maintain his working place.

The exposed roof and walls of every excavation that is traversed by employees in going to and from their

working place shall be surface inspected daily, and shall be scaled to remove loose or dangerous matter.

The foregoing shall not apply to abandoned excavations.

7-3.6. REMOVAL OF WASTE MATERIALS. Waste timbers, packing and wrapping materials, paper, and all other rubbish shall be removed to the surface and shall not be allowed to accumulate underground, unless such material has been buried completely under waste rock.

7-3.7. DUST CONTROL IN DRILLING OPERATIONS. In every underground mine where holes are drilled or bored by machinery in any stope or raise in ground that causes dust from drilling, machinery shall be equipped with water jet or spray or other means equally efficient to prevent the escape of dust.

7-3.8. DUST CONTROL IN BLASTING, MUCKING, AND CRUSHING OPERATIONS.

Blasting and mucking operations shall be so conducted that the concentration of dust in the air breathed by the workmen shall not exceed 10,000,000 particles per cubic foot when working in rock containing 10 percent or more by weight of free silicon dioxide, or 100,000,000 particles per cubic foot when working in rock containing less than 10 percent by weight of free silicon dioxide. It shall be the duty of the mine owner or operator to submit acceptable evidence that such percentages exist uniformly throughout the rock formation.

The free silicon dioxide content of rock shall be determined from composite samples representative of the rock as a whole.

The dust concentration shall be determined from at least three atmospheric dust samples, of at least 10 minutes duration, spaced at intervals to yield a fair average measurement of exposure, collected in the normal breathing zone of the workmen in the excavation by a standard type impinger, or other equivalent sampling instrument. The dust concentration shall be deemed to be the average concentration as determined from the samples by the use of the light field, low-power technic count or its equivalent.

7-3.9. GENERAL VENTILATION. Ventilation of not less than 75 c.f.m. shall be provided for every person employed underground. For rules relating to ventilating equipment see rules 7-6.1. to 7-6.8.

7-3.10. PLATFORMS, STAIRWAYS, etc. All platforms, walkways, stairways, ladders, and railings shall be securely constructed and maintained in a safe condition.

7.3.11. REPORTS ON ACCIDENTS. Every unusual occurrence resulting in a hazardous or dangerous condition from fire, water, cave-ins, broken hoist-way gear, flammable gas, or explosion shall be reported by the superintendent to the Commissioner on forms provided by the said bureau within 24 hours after the time of discovery thereof.

Every death occurring in a mine or outside such mine from injuries received therein, shall be reported immediately by the superintendent or other person in charge, by telephone or telegraph to the Commissioner, to be supplemented by a detailed report thereof.

7-3.12. ATTENDANCE RECORD. A written or printed record shall be made of all persons entering underground. Such record shall give the date, the time of the shift and the name of every person entering underground. The time of exit of each person from underground shall be entered on such record. Such record shall be in the office above ground and shall be subject to inspection by the Commissioner.

7-3.13. EMPLOYMENT OF MINORS. No male person under 16 years of age and no female person of any age, shall be employed in underground mine workings.

7-3.14. PROTECTIVE CLOTHING. All employees entering underground shall wear approved protective hats and safety foot wear. Waterproof clothing shall also be worn by employees when exposed to wetting by water.

7-3.15. DIRECTIONAL SIGNS. Directional signs shall be posted in every passageway of mines to indicate the way toward the exit.

7-3.16. ACCEPTABLE EQUIPMENT. Only acceptable electrical equipment shall be used in potentially gassy atmospheres.

7-3.17. REPAIR OF ACCEPTABLE EQUIPMENT. After making repairs to acceptable equipment or machinery and before the same are put back into service they shall be restored to a safe condition. Repairs to and inspection of such equipment or machinery shall be made in accordance with precautional instructions included in the approval plate.

7-3.18. AIR HOSE. All air hose couplings at the headings, two inches or more in diameter shall be clamped or chained or otherwise secured against whipping due to a break in the compressed air line.

7-3.19. FIRE-FIGHTING EQUIPMENT. Every haulage level underground where a fire hazard exists, shall be provided with approved portable fire extinguishers that shall be maintained in proper operating condition, shall be housed against injury, shall be installed in convenient places and shall be marked conspicuously.

7-3.20. FLAMMABLE GAS. When the concentration of flammable gas as determined by the approved method, in any excavation or part thereof exceeds one percent by volume, it shall be the duty of the superintendent or other person

in charge to notify at once by telegraph or telephone the Commissioner of Labor of such gas concentration.

When the concentration of flammable gas, as determined by the approved method, in any excavation or part thereof exceeds 1.5 percent by volume, it shall be the duty of the superintendent or other person in charge, to order all work in such excavation or affected part thereof to cease immediately, to direct all employees and others to vacate such excavation or affected part thereof. Thereafter, no employee or other person shall be permitted to re-enter the said excavation or affected part thereof, nor shall work therein be resumed until precautionary measures have been invoked and instituted and authorized by the Commissioner.

7-3.21. GUARDING OF MOVING MACHINERY AND EQUIPMENT. All gears, belts, chains, and other moving parts of machinery and equipment shall be provided with proper guards so designed as to prevent injury to employees.

7-3.22. INTOXICATING LIQUOR. No person shall, while under the influence of intoxicating liquor, enter any mine or any building connected with the operation of the same, where miners or other workmen are employed, nor shall intoxicating liquors be brought into any such places. Provided, however, that nothing herein contained shall prevent the carrying of any alcoholic spirits or stimulants into such mine or building for the purpose of administering to any one injured therein.

7-4. SANITATION.

Toilet Closets.

7-4.1. GENERAL. Every main working level shall be provided with toilet facilities that shall consist of dry closets, water closets, chemical closets or closet cars.

7-4.2. NUMBER REQUIRED. At least one closet shall be provided on each main level for each 25 men or less employed on such level.

7-4.3. LOCATION. Every such toilet closet shall be readily accessible to all employees.

7-4.4. CONSTRUCTION. Every such toilet closet shall be constructed as to provide for easy and effectual cleaning and removing of the contents.

7-4.5. CLEANING. all dry toilet closets shall be cleaned at least twice every week and the contents shall be immediately removed to the surface.

7-4.6. MAINTENANCE. All dry toilet closets shall at all times be maintained in a disinfected or deodorized condition.

7-4.7. USE. all persons underground shall use the toilet closets provided for them.

WATER AND WASHING FACILITIES.

7-4.8. DRINKING WATER. An ample supply of drinking water shall at all times be maintained readily accessible on each main working level. Drinking water shall be maintained clean, free from contamination and potable and shall be approved by the local health authority.

7-4.9. WASHING FACILITIES. Every mine where 10 or more are employed shall be provided with a wash and change house or change room. Such wash and change house or change room shall be both heated and properly lighted and shall be provided with enough warm water sufficient for all employees on the basis of one faucet for every 10 or more persons.

7-5. LIGHTING.

7-5.1. GENERAL. Except where individual lamps are provided, every excavation that is used as a passageway for men shall be so illuminated as to render all parts of such excavation clearly visible.

7-5.2. STATION LIGHTING. Stationary lights shall be provided during the working hours at all shaft stations during the time they are in actual use and at all stations on the levels where hoisting or hauling is effected by means of machinery.

7-5.3. MACHINERY. All places where hoists, pumps or other machinery is erected and in the proximity of which persons work or move about shall be so lighted when such machinery is in operation that the moving parts thereof can be clearly visible and distinguished.

7-5.4. OPEN LIGHTS--WHERE PROHIBITED. Open flame lights of any type or description shall not be carried into any potentially gassy atmosphere under any circumstances.

7-5.5. OPEN LIGHTS--WHEN PERMITTED--DUTY TO EXTINGUISH. The use of open flame lights shall be permitted except in a potentially gassy atmosphere. It shall be the duty of any person using any type of open flame light in a mine, to extinguish such light before departing from the mine unless such light is taken to the surface above the ground.

7-5.6. ELECTRIC LIGHTS--GASSY ATMOSPHERE. Stationary lights and extension lights together with their sockets used in potentially gassy atmosphere shall be of an explosion proof type.
7-5.7. PORTABLE LAMPS--GASSY ATMOSPHERE. Portable lights other than approved flame safety lamps, approved hand lamps, or approved cap lamps shall not be used in any potentially gassy atmosphere.
7-5.8. SURFACE LIGHTING. Except where individual lamps are provided, all points above ground where men are required to work or to pass shall be adequately lighted.
7-5.9. EMERGENCY LIGHTING. Lamps or other proper lights shall be kept ready for use in all underground stations where a failure of electric light is likely to cause danger.

7-6. VENTILATION.
7-6.1. PERSONNEL. The superintendent shall designate competent and qualified persons who shall have exclusive control over the under-ground ventilating systems.
7-6.2. STOPPAGE OF AIR FLOW. Any accidental stoppage or substantial diminution of air flow from a ventilating system to the underground workings shall be immediately reported to the superintendent. If the superintendent determines that such stoppage or diminution of air flow may affect the health or safety of employees underground, he shall direct all work in the area or areas affected to cease and all employees in such area or areas to be removed to an unaffected area or to the surface until such stoppage or diminution of air flow has been corrected and the affected area or areas made safe for resumption of work.
7-6.3. CAPACITY OF FAN MOTORS. The capacity of all fan motors used for ventilating places underground shall be enough to carry the maximum load that may be imposed thereon without overloading.
7-6.4. CAPACITY OF FANS. Fans shall not be loaded beyond their rated capacity. The capacity of fans shall be such that the required rate of air flow will be delivered at the maximum resistance that may be imposed on the duct system.
7-6.5. HOUSING OF FANS. Where ventilating fans or blowers situated above ground are housed, such housing shall be in building or enclosures constructed of fire-resistive material. Where stationary ventilating fans located underground are housed, such housing shall be in enclosures constructed of fire-resistive material.
7-6.6. SOURCE OF AIR SUPPLY. The air supply for ventilating systems shall be from an uncontaminated source.
7-6.7. PIPING. All ducts and pipes used for ventilation under-ground shall be maintained tight at all times so as to provide enough air to places underground and, where flammable or noxious gases are present, an efficient removal of such gases when the ventilating system is employed as an exhaust system.
7-6.8. LIGHTING PROTECTION--FAN CIRCUITS. Every circuit supplying power to a fan that may be subject to the effect of lightning shall be protected near the fan house by means of a lightning arrester with an efficient ground.

7-7. AID TO THE INJURED.
7-7.1. STRETCHERS, BLANKETS. A stretcher, a woolen blanket and a water proof blanket, all in good condition for use in carrying any person who may be injured in or about the mine shall, at all times, be kept and be readily available at such place or places about the mine as the Commissioner may direct. In Mines where more than 100 persons are employed not less than two stretchers, two woolen blankets and two waterproof blankets shall be kept.
7-7.2. SUPPLIES. An adequate supply of materials and equipment for providing emergency aid and relief to injured persons shall at all times be kept readily accessible in and about the mine. These shall include compressed oxygen, resuscitation equipment, one extra-long gauze bandage with compress sewed in center, one triangular bandage with methods of application printed thereon, one card of instructions, large first-aid dressings for wounds, packages of sterilized gauze, assorted bandages for wounds, United States Army tourniquet, carbolated Vaseline or boric acid ointment, packages of picric acid gauze, wooden or wire-gauze splints, packages of absorbent cotton, safety pins, shears, tweezers, aromatic spirits of ammonia, paper cups, first aid book of instructions, soap, basin, and towels. Where a hospital is maintained by the owner or operator in connection with a mine there shall be provided only such emergency materials and equipment as is necessary to prepare the injured person for removal to hospital.
7-7.3 PERSONNEL. Every superintendent, every foreman and at least one person under every foreman's direction shall be instructed in and capable of administering proper first aid to injured persons.
7-7.4. FIRST-AID CORPS. Where 100 or more men are employed per shift a first-aid corps shall be organized and shall consist of the superintendent, all foremen, shift bosses, and other persons designated by the superintendent.
7-7.5. CORPS MEETING. The first-aid corps shall meet not less than once in every three months for instruction by a physician or a registered nurse or a person holding a certificate from the American Red Cross or the U. S. Bureau of Mines authorizing such person to administer first-aid.

7-7.6. MOTOR AMBULANCE. There shall be available within a six mile radius of the entrance to the underground, a motor vehicle properly equipped to carry at least two persons on stretchers and two attendants.
7-7.7. SAFETY GOGGLES. Safety goggles shall be provided by the owners or operator and shall be worn by the employees where there is danger of being struck by flying particles of rock or other material unless screens are provided for the protection of the employees.

7-8. MINE MAPS AND PLANS.
7-8.1. EXCAVATION MAP. The operator or owner of every mine shall make and maintain, or cause to be made and maintained by a competent engineer or surveyor, a clear and accurate map, or maps, of uniform scale, not less than 100 feet to the inch, with sections, showing clearly all the workings of such mine.
7-8.2. MAINTENANCE OF MAPS. At least once in every six months, or oftener, if necessary, the operator or superintendent of each mine shall cause to be shown clearly and accurately on the map or maps of such mine all the excavations made therein during the time elapsed since such excavations were last shown on such map or maps, and all parts of such mine that shall have been worked out or abandoned during said elapsed period of time shall be clearly indicated on said map or maps, and all underground workings shall be surveyed and mapped before they are allowed to become inaccessible.
7-8.3. INSPECTION AND FILING OF MAPS. Such maps shall at all times be open to the examination of the Commissioner. In the event of the closing of a mine under conditions that will result in its workings becoming inaccessible, the maps herein specified, or certified copies of them, shall be filed with the Commissioner.
7-8.4. AIR AND WATER LINE MAPS. A separate map showing all compressed air lines, water lines, and ventilating ducts in shafts and on main haulage levels and their dimensions and the positions of all sumps, valves, hydrants, fans and pumps shall be made by a competent person and maintained by the operator or owner of the mine on the premises. Such map shall be maintained up-to-date and shall be subject to examination by the Commissioner.
7-8.5. PLANS OF ELECTRICAL SYSTEMS. A clear and accurate plan of all stationary electrical equipment and machinery shall be made by a competent person and maintained by the operator or owner of the mine in the office. Such plan shall be maintained up-to-date and shall be subject to inspection by the Commissioner. Such plan shall show the location of all stationary apparatus of more than 25 kilowatts capacity including conductors, lights, switches and trolley lines; also, the horsepower of each motor, the capacity of each generator and transformer and the nature of their use. The place where such equipment is installed shall be clearly indicated on such plans.

7-9. TELEPHONES.
7-9.1. GENERAL. Every mine shall be equipped with a telephone system connecting the superintendent's office with at least one station on every level on which men are working. Such phones shall not be more than 1,000 feet from any place on such level where men are working.
7-9.2. HOUSING. Telephones shall be so housed as to protect them from dirt and moisture.
7-9.3. SHAFT STATIONS. Every underground shaft station on levels on which men are working shall be provided with a telephone which shall be connected to the surface.

7-10. EXITS.
7-10.1. TWO OPENINGS TO SURFACE. It shall be the duty of every operator of every mine to maintain at least two outlets to the surface from such mine, or an underground communicating passageway between such mine and some other mine, so that there shall be at all times at least two distinct and available means of access to the surface to all persons employed in such mine. Such outlets shall be not less than 200 feet apart and there shall be between them a space not less than 100 feet in width free of combustible material.
7-10.2. EXEMPTION FROM REQUIREMENTS OF 7-10.1. The requirements of rule 7-10.1. providing for the maintenance of at least two outlets to the surface, shall not apply to: (a) shafts or mines in the process of being connected to comply with the terms of said rule; (b) shafts, winzes, adit levels, tunnels, and drifts to prospect for and develop mineral substances, but not for the extraction of mineral substances except such as may be extracted in the course of such prospecting and developing work or abandonment of mine; (c) any mine in which one of the shafts or outlets shall have temporarily become unavailable for the persons employed in the mine and in which every effort is being made by the operator of the mine to open such temporarily unavailable outlet, provided the same is not in the opinion of the Commissioner, dangerous to the life and health of those employed therein; (d) mines having workings less than 100 feet deep and extending less than 300 feet from the shaft in any direction, but not mines opened primarily by an

adit level or tunnel; and (e) mines opened by an adit level, tunnel or drift less than 1000 feet long; provided, that mines opened by an inclined shaft of less than 20 degrees angle from the horizontal shall be considered for the purpose of these rules as equivalent to a mine opened by an adit level, tunnel, or drift.

In any prospect or development exempt under subdivision (b) above from providing at least two outlets to the surface, not more than 25 men shall be permitted to work underground at any one time. The exemption granted under the provisions of subdivision (b) may be withdrawn by the Commissioner when after investigation by him, the operation has, in his opinion, extended beyond the prospecting or development stage. In mines opened by adit levels, slopes, or both, the Commissioner may waive the requirements of rule 7-10.1., when, after investigation by the Commissioner, existing conditions are, in his opinion, found to be such that the safety of the occupants would not be endangered thereby.

7-10.3. OPENINGS THROUGH OTHER MINES. When a common communicating escapement outlet is established between mines, by mutual agreement, such outlet shall be maintained clear of obstruction to travel, and intervening doors, if any, shall be kept unlocked and ready at all times for immediate use while persons are at work in either mines. Whenever escape by such communicating outlet is cut off, the owner or operator, upon whose property the secondary outlet is located and is rendered unavailable, shall immediately notify the owner of the adjoining mine and the Commissioner.

7-10.4. MINES HAVING ONLY ONE OUTLET. In every mine where under the provisions of rules 7-10.1. and 7-10.2. of these rules, only one outlet is required, and where a single shaft affords the only means of ingress or egress to persons employed underground, such shaft shall be divided into at least two compartments by solid incombustible partitions.

One such compartment shall be used exclusively as a ladderway. No hoisting shall be done in such ladderway. Buildings hereafter erected over such shafts shall be constructed of incombustible material. Whenever such shafts are covered by buildings heretofore erected of non-fireproof material, they shall be provided with a substantially constructed bulkhead of fire resistive material over the ladderway. Such bulkhead shall be at least 25 feet below the collar of the shaft.

Below such a bulkhead an outlet or passageway from such ladderway shall be driven to a point on the surface at least 300 feet from the wall of building covering the shaft. Such outlet or passageway shall at all times be maintained in good condition and shall afford safe and unobstructed exit in case of fire. Every adit, tunnel or inclined shaft having an inclination, of less than 20 degrees from the horizontal and which constitutes the only outlet from the underground shall be similarly provided with a bulkhead and side outlet if covered by a non fireproof building.

7-10.5. ENTRANCE STRUCTURES. Every structure hereafter erected over any mine entrance except the head frame of a hoist and doors or hatches used for closing the entrance shall be constructed of incombustible material.

7-10.6. EXIT DOORS IN MINES. It shall be the duty of every mine owner or operator to provide every adit, tunnel, inclined shaft, or slope of less than 20 degrees angle from the horizontal, the mouth of which is covered by a building or structure of any kind, with a tightly fitting door near the mouth of such adit, tunnel, inclined shaft, or slope of less than 20 degrees angle from the horizontal that can be closed from the outside of the building or structure by means of a pull wire or cable.

7-10.7. LADDERWAYS--GENERAL. In addition to any mechanical means of ingress and egress, every mine shall be provided with at least one exit by means of a man-way extending from the lowest working level to the surface. All man-ways having a slope of more than 30 degrees shall be provided with ladderways or stairways.

7-10.8. LANDING PLATFORMS--WHERE REQUIRED. Ladderways having a mean slope of more than 70^{o} from the horizontal and a length of over 40 feet shall be provided with substantial landing platforms at intervals not exceeding 25 feet measured vertically.

7-10. 9. PLATFORM OPENINGS--GUARDING. Each landing platform shall be provided with an opening of sufficient size to permit the passage of one man. Except for such opening, such platforms shall either closely cover the cross-sectional area of the ladderway or shall be provided with handrails on all otherwise unprotected sides.

7-10.10. LOCATION AND DIRECTION OF INCLINATION OF LADDERS. Ladders having an inclination of more than 80^{o} from the horizontal and which constitute a main ladderway, shall all be inclined in the same direction and shall all be located on the same side of the main shaft. Under no circumstances shall a ladder inclining backward from the vertical be installed.

7-10.1l. VERTICAL LADDERS. Ladders located in other than main ladderways not used as an exit and not exceeding 40 feet in length may be installed vertically.

7-10.12. LADDERS IN EXIT LADDDERWAYS. Ladders in exit ladderways shall project at least three feet above every landing or hand grips shall be so installed as to provide a safe condition for mounting or dismounting

the ladder.
7-10.13. WIDTH 0F LADDERS. Ladders shall be not less than 12 inches wide between rails.
7-10.14. LADDER RUNGS. The distance between centers of ladder rungs shall not exceed 14 inches. The spacing of rungs shall be uniform for all ladders throughout the ladderway.
7-10.15. TOE CLEARANCES. There shall be at least three inches clearance between all ladder rungs and the wall or any other projection.
7-10.16. SINKING SHAFTS. During the operations of sinking a shaft having a slope of more than 30^{o} from the horizontal, such shaft shall be provided with a ladderway or an auxiliary hoist. Where a ladderway is provided, it shall extend downward to a point 60 feet above the working level. Wire ropes or wooden extension ladders or chains shall be provided from the bottom of the shaft to the lower end of the ladderway.
7-10.17. CLEANING OF MANWAYS. The timbers in all vertical and inclined ladderways and manways in daily use shall be cleaned of all loose rock lodged upon them at least once in every 24 hours. Manways in daily use shall be kept clear of obstructions.

7-11. PROTECTION OF OPENINGS.
7-11.1. DISUSED SHAFTS. All openings into shafts not being used for the passage of men or material shall be securely and permanently closed to the passage of persons by means of a fence or a tight covering.
7-11.2. SURFACE OPENINGS. The sides of all openings on the surface where the drop into the opening exceeds six feet shall be securely protected by a fence.
7-11.3. ABANDONED EXCAVATIONS. All abandoned excavations shall be securely fenced or completely closed to the passage of persons.
7-11.4. SUMPS. All sumps shall be securely fenced off or covered.
7-11.5. STOPES. In stopes timbered with square sets, the working floors shall be closely and securely lagged over. Openings in the floors shall be protected by railings.
7-11.6. DRIFTS. Where material is dropped from an overhead excavation into a drift such space in the drift shall be closed to the passage of persons by a railing while material is being dropped.
7-l1.7. PROTECTION AT SHAFT STATIONS. At all shaft stations a gate or guard railing shall be provided and kept in place across the shaft, except when the cage, skip, bucket, or other conveyance is being loaded thereat, but this requirement shall not prohibit the temporary removal of the gate or railing for the purpose of making repairs or other operations, provided proper precautions to prevent danger to persons are taken.
7-11.8. SHAFT DOORS. If hoisting be done from a depth greater than 25 feet by means of a bucket, shaft doors shall be installed in such a manner that they will prevent any material from falling into the shaft while the bucket is being emptied, and such doors shall be kept closed while the bucket is being emptied.
7-11.9. ENTERING SHAFTS. All stations or levels shall have such a passageway through or around the working shaft that crossing through the hoisting compartment shall be avoided.

Entering or crossing the hoisting compartment or a shaft, except to ascend or descend, or for the purpose of effecting repairs is prohibited.

Before repairs are commenced the person in charge of directing the repairs shall inform the hoisting engineer of the nature, extent and location thereof.
7-11.10. WINZES. Every winze over 45^{o} from the horizontal and opening directly from the floor of a drift or stope shall be barred by means of a substantial railing or shall be covered by a tight planking or heavy screening with removable covers for necessary openings.
7-11.11. RAISES. The driving of raises for shaft dimensions of more than 80^{o} from the horizontal shall be done in two compartments, one of which shall be a protected ladderway.
7-11.12. SAFETY BELTS. Safety belts shall be provided for and used by all persons required to work in excavations having a slope of more than 45^{o} from the horizontal unless other means are provided to prevent a fall of more than 10 feet.

7-12. EXPLOSIVES.
GENERAL
7-12.1. STORAGE. All magazines and all other enclosures in which explosives are stored shall be kept locked at all times except during the time of placing explosives therein or removing explosives therefrom.
7-12.2. ACCESS TO EXPLOSIVES. No persons other than those authorized by the superintendent shall have access

to magazines or other storage enclosures.

7-12.3. HANDLING PERSONNEL. No persons other than those duly authorized by the superintendent shall handle or use explosives. The superintendent shall authorize only those persons who have proper training and experience for this work.

7-12.4. SMOKING AND OPEN LIGHTS. Smoking or open lights or other flame is prohibited in or within a radius of 50 feet of any explosives magazine or other storage enclosures.

7-12.5. MARKING. Every package of explosives, detonators, or fuse received at the mine shall be plainly marked to designate its kind and grade, the name and address of its manufacturer, and the date of its manufacture. If the date of manufacture is in code, the key to such code shall be obtained from the manufacturer. In addition, each package of explosives shall be clearly marked with the fume class which indicates the amount of poisonous gas produced per one and one-fourth inch by eight inch (11/4 "x 8") cartridge. (A) For the purpose of this rule, the poisonous gas producing properties of an explosive shall be the volume of carbon monoxide plus hydrogen sulfide emitted per one and one-fourth inch by eight inch (1 1/4" x 8") cartridge, as shown by tests in the Bichel Guage the resulting gases do not contain more oxygen than is sufficient to burn the combustible gases to their maximum oxidizable state.

7-12.6. EXPLOSIVES FOR USE. Explosives other than those in Fume Class 1, Fume Class 2, or Fume Class 3 shall not be used. The use of black powder or straight nitro-glycerin dynamite is prohibited. The use of frozen dynamite is prohibited.

7-12.6.1. The amount of poisonous gases produced per one and one quarter inch by eight inch cartridge shall be as follows:

Fume Class 1--less than 0.16 cubic feet
Fume Class 2--0.16 to 0.33 cubic feet
Fume Class 3--0.33 to 0.67 cubic feet

7-12.6.2. Cartridges of explosives eight inches in length which are smaller in diameter than one and one-quarter inches shall comply with the limit specified for the fume class of the one and one-quarter inch by eight inch cartridge. For cartridges other than eight inches in length, the amounts of poisonous gases are computed by proportions to a length of eight inches and this latter figure shall comply with the limit specified for the fume class of the one and one-quarter inch by eight inch cartridge.

7-12.6. EXPLOSIVES FOR USE.

7-12.6.3. Designation on container.

7-12.6.3.1. All cases containing explosives for underground use shall be clearly marked in one-quarter inch or larger letters with its fume classification.

7-12.7. DETONATORS FOR USE. No detonator shall be used unless its initiating power, as measured in the TNT-iron oxide insensitive powder test, appended hereto and made a part hereof, is at least equal to a detonator containing one gram of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate.

7-12.8. FUSE FOR USE. The burning speed of fuse shall be determined by adding the times in seconds recorded when three lengths of fuse each three feet long are burned unconfined in the open and the total is divided by three. Each of the three foot lengths of the brand of fuse used in the test for which the manufacturer strives to maintain an average burning speed of 90 seconds shall burn within the limits of 81 to 99 seconds. Each of the three foot lengths of the brand of fuse used in the test for which the manufacturer strives to maintain an average burning speed of 120 seconds shall burn within the limits of 108 to 132 seconds. No length of fuse less than 30 inches shall be used.

7-12.9. OPERATIONS DURING ELECTRICAL STORMS. All transportation of explosives on the surface or to underground storage enclosures, and any handling incident thereto, shall be stopped immediately upon the approach of an electrical storm, and all persons shall immediately retire to a place of safety. During shaft sinking operations, persons under ground shall be notified of the approach and cessation of an electrical storm by means of signals on the general lighting circuit. Such signals shall consist of four periods of darkness as a warning, and two periods of darkness to indicate all clear. All loading of holes to be fired electrically and all work in connection with electric blasting in shaft sinking operations or other underground operations shall be stopped immediately, and all persons shall withdraw to a safe distance from such operations.

7-12.10. DESTROYING EXPLOSIVES. Explosives and detonators which have deteriorated, or have been damaged so that they have become unfit for use, shall be destroyed by a person authorized by the superintendent and who is fully acquainted with the standard procedure in this type of work.

7-12.11. CHARGING OPERATIONS. No persons other than those authorized by the superintendent shall be permitted to be present in the vicinity and within a distance of 150 feet of the face during the time it is being charged.

MAGAZINE ON THE SURFACE.

7-12.12. All magazines hereafter constructed on the surface must, unless otherwise authorized by the Commissioner, be located in accordance with the American Table of Distance, except that no magazine shall be placed less than 200 feet distant from any mine opening or vital structure.

7-12.13. CONSTRUCTION OF MAGAZINES. Magazines must be fire-resistant, waterproof and bullet-resistant, except that magazines used for storage of blasting supplies do not have to be bullet-resistant. The floors of all such magazines shall be laid with sound tongued and grooved boards free from loose knots. All nails in the interior of the magazine shall be countersunk. The ground around the magazine for not less than 25 feet, preferably 50 feet, in all directions shall be kept free of rubbish, dead grass, shrubbery or other combustible material. Magazines shall be ventilated and the openings for ventilation shall be so screened that sparks of fire may not enter therein. Magazines shall have thereon printed in letters not less than 6 inches high "MAGAZINES-EXPLOSIVES-DANGEROUS".

7-12.14. MAINTENANCE AND REPAIRS. Magazines shall at all times be kept clean and dry. Before any alterations are made on any part thereof, all explosives shall be carefully removed and the magazine thoroughly washed out. All discarded wooden parts shall be burned in a safe place.

7-12.15. MAGAZINES--STORAGE OF EXPLOSIVES OTHER THAN DETONATORS.

Detonators, blasting supplies, tools or materials shall not be stored in any magazine containing other explosives. Such magazine shall be destroyed in any magazine containing other explosives. Such magazine shall be devoted exclusively to the storage of such other explosives. Fuse may also be stored therein as authorized in rule 7-12.17.

7-12.16. MAGAZINE FOR DETONATORS. Detonators shall be kept in a separate magazine, and not tools or materials or explosives other than detonators shall be stored in a detonator magazine. Fuse may also be stored therein, as authorized in rule 7-12.17.

7-12.17. STORAGE OF FUSE. Fuse may be stored in magazines for detonators or for other explosives, or it may be stored in any substantially constructed, dry, well ventilated building or enclosure, provided it is kept locked or attended by an authorized person at all times.

7-12.18. ILLUMINATION. Lighting within, or the area surrounding magazines for a distance of not less than 50 feet in all directions shall be natural or by means of approved portable electric storage battery lamps.

7-12.19. REMOVAL FROM MAGAZINES. In using explosives or blasting supplies of any kind those that have been longest in the magazine shall be used first.

7-12.20. OPENING CASES. Cases of explosives shall be opened at a distance of not less than 50 feet from any magazine. No metallic tools shall be used to open kegs or wooden cases of explosives. Metallic slitters may be used for opening fiberboard cases, provided that the metallic slitter does not come in contact with the metallic fasteners of the case.

7-12.21. TRANSPORTATION. Vehicles carrying explosives shall not be permitted to transport in the body of the truck any metal tool, piece of metal, fire, match, exploder, blasting cap or other device for producing spark, flame, or heat, firearms, acids, inflammable substances or similar materials.

STORAGE AND TRANSPORTATION UNDER GROUND.

7-12.22. SUPPLY. The maximum amount of explosives which may be stored underground shall not exceed a 7 days supply. Such explosives shall be stored in magazines for which a certificate has first been issued by the Commissioner of Labor and an accurate daily record of explosives shall be kept.

7.12.23. MAGAZINES. Magazines used for storage of explosives underground shall be constructed of brick, concrete, iron or wood covered with iron, with a hinged lid, or a horizontal excavation, the entrance to which shall be provided with a hinged door and the inside walls of which shall consist of or be lined with incombustible material. The cover or door of such magazine shall have printed thereon, in letters at least six inches high, the words "MAGAZINE--EXPLOSIVES--DANGEROUS".

7-12.24. LOCATION OF MAGAZINES. Magazines shall be so located that the accidental detonation of their contents will not cut off the escape of men working underground nor shall they be placed in any passageway adjacent to any shaft landing or adjacent to any electric circuit other than a lighting circuit.

7-12.25. PROTECTION OF MAGAZINES. All magazines shall be so located and so protected as to prevent accidental impact from vehicles or falling objects.

7-12.26. SEPARATION OF MAGAZINES. Magazines containing detonators shall not be located closer than 25 feet from any magazine containing other explosives.

7-12.27. CONTENTS OF EXPLOSIVES MAGAZINES. No material or articles other than a wooden wedge and

wooden mallet shall be placed in magazines used for the storage of explosives.

7-12.28. CONTENTS OF DETONATOR MAGAZINES. No material or articles other than caps, fuse, capped fuses, or electric detonators may be stored in a detonator magazine, except a wooden wedge and wooden pallet.

7-12.29. ILLUMINATION OF MAGAZINES. Magazines shall be lighted from the outside or by approved portable electric storage battery lamps or permanent interior lights provided explosion proof fixtures are used.

7-12.30. DAILY SUPPLY. All daily supplies of explosives within the mine shall be kept in stout, tight boxes with hinged lids, which shall be kept securely locked except at such times as explosives are placed therein or removed therefrom, from which the explosives shall be removed only as required for immediate use.

7-12.31. CLEANING OF MAGAZINES. The floor of every storage space and the top of every daily storage box and the area surrounding it shall at all times be kept clean and free from particles of explosives.

7-12.32. OPENING PACKAGES. Cases of explosives shall not be opened at a distance of less than 50 feet from any magazine. No Metallic tools shall be used to open kegs or wooden cases of explosives. Metallic slitters may be used for opening fiberboard cases provided that the metallic slitter does not come into contact with the metallic fasteners of the case.

7-12.33. FUSE CAPPING. The cutting and capping of fuse shall not be done at any place that is less than 50 feet from any explosives magazines, and at any place that is less than 25 feet from any detonator magazine. Fuses may be cut and capped at the face or at special benches provided for this purpose. Fuse shall be cut square and caps shall be crimped by means of cap crimpers only. No person shall be permitted to cap fuses unless he is experienced in such work and has been duly authorized by the superintendent to do so.

7-12.34. PRIMERS. Primed cartridges shall not be made up at any place that is less than 50 feet from any explosives magazine, and at any place that is less than 25 feet from any detonator magazine. Primers may be made near the face or at special benches provided for the purpose or at benches provided for capping of fuses. They must be kept in insulated carriers or containers, separate from other explosives and detonators, at all times until placed in boreholes, and shall be detonated within 36 hours after preparation. No person shall be permitted to make up primed cartridges unless he is experienced in such work and has been duly authorized by the superintendent to do so.

7-l2.35. TRANSPORTATION FROM SURFACE. The supply of explosives shall be transported from magazines on the surface without interruption directly to the underground magazines and immediately placed therein. No person except attendant shall ride on any vehicle with explosives or detonators when being transported from the surface to underground storage enclosures.

7-12.36. DISTRIBUTION UNDERGROUND. Separate insulated cars, containers, or compartments shall be provided for carrying explosives and detonators from magazines, and capped fuses and primers from special benches to working places. Receptacles, specially designed for the purpose, and having a capacity not in excess of 50 pounds, shall be used for carrying explosives to headings. The amount of explosives carried to headings shall not exceed the amount estimated to be necessary for the charge.

BLASTING--GENERAL.

7-12.37. EXAMINATION OF FACE. Before regular drilling is commenced on any shift a thorough search shall be made for unfired explosives remaining from a previous shift and all unexploded charges shall be fired.

7-12.38. DEEPENING HOLES. No drilling shall be done in any hole that has at one time contained explosives.

7-12.39. SIZE OF HOLES. All drill holes shall be of sufficient size, or cartridges of explosives of proper size shall be selected so that the cartridges of explosives can be easily inserted to the bottom of the hole without forcing or ramming.

7-12.40. REMOVING CARTRIDGE WRAPPERS. Dynamite shall not be removed from its original wrapper and loaded into bore holes, except block holes.

7-12.41. LOADING AND TAMPING. Loading and tamping of explosives shall be done only with a hardwood rod free from any ferrous metal parts.

7-12.42. ADJACENT WORKING. Whenever blasting operations are carried on at points where a break-through to an adjacent or nearby working where men are at work, may reasonably be anticipated, the foreman or person in charge of such operations shall, before any holes are loaded, give warning of danger to all persons that may be working where the blast may break through and shall not allow any holes to be charged until such warning is acknowledged and all persons removed to a place of safety.

7-12.43. METHOD OF FIRING. Firing shall be done by means of safety fuse, a blasting machine or a power or lighting circuit of not over 440 volts, except that no blasts shall be fired by means of fuse in shafts or steep slopes from

which men have to be hoisted to safety.

7-12.44. BLASTING--CIRCUIT-TYPE. Blasting circuits shall be thoroughly insulated and damaged leading wire shall not be used. All circuits used for blasting shall be ungrounded circuits.

7-l2.45. MAKING CONNECTIONS. The power source end or leading wires shall be short-circuited during the time connections are made at the face and until attached to the source of power.

7-12.46. TESTING CIRCUITS. The testing of electric detonators and circuits shall be done only by means of a blasting galvanometer designed for testing blasting circuits.

7-12.47.. FIRING SWITCH. When firing by means of a power circuit the same shall be controlled by a switch. Such switch shall be fired in position and wholly enclosed in a tight box which shall be kept locked at all times except while firing. The switch shall be provided with a short circuit in "off" position and so installed that the box can be locked only when the switch is in the "OFF" position. No person other than those duly authorized by the superintendent shall have access to the switch.

7-12.48. BLASTING CIRCUIT PLUGS. When firing by means of a power or lighting circuit, such circuit shall at all times be broken in at least one place by a lightning gap, of at least five feet, on the incoming side of the firing switch, except during the firing operation. The connections at such gap shall be made by means of flexible leads and plugs.

7-12.49. USE OF BLASTING MACHINES. When firing by means of a blasting machine the leading wire shall be kept short circuited until the shot is ready for firing and shall not be connected to the blasting machine until immediately before the time of firing, and shall be disconnected from the blasting machine and short-circuited immediately after firing.

7-12.50. LIGHTING FUSE. Fuse shall be lighted with an effective type of lighter and not with burning paper or other flammable refuse.

7-12.51. WARNING AND RETREAT. Before lighting fuse or firing electrically the blaster shall sound a warning distinctly audible to all persons within the danger zone and all such persons shall retire a safe distance or to a safe shelter. The blast shall not be fired until the blaster or other person in charge has ascertained that all persons have retired a safe distance or to a safe shelter.

7-12.52. RETURN TO THE FACE. No person shall return from such safe distance or shelter until so permitted by the person in charge, but in no case in less than fifteen (15) minutes after the blast. When there is doubt that all shots have been fired, no one shall return to the face within one (1) hour after the blast.

7-12.53. MISFIRES. Before workmen are permitted to return to the working area in which explosive charges have been fired, the blaster shall make a careful examination for any unfired explosives and shall insert into the mouth of each misfired hole a red danger signal. The location of every hole containing an unfired charge left by a shift shall be reported to the person in charge of operations on such shift, to the person in charge of operations on the succeeding shift.

7-12.54. UNEXPLODED CHARGES. Explosives shall not be extracted from a charge hole that has misfired. An additional primer charge shall be inserted in such hole and the charge shall be refired. If such charged hole that has misfired cannot be refired in this manner, it shall be placed under the supervision of one experienced in handling such misfires, who shall dispose of such misfires before work is permitted to be resumed in that area.

7-12.55. RECORD OF MISFIRES. A record shall be made each day of all misfires, of the name of the person who placed such misfired charges, and of the name of the person who refired such misfired charges. Such record shall be kept at the mine office.

7-13. COMBUSTIBLE LIQUIDS--STORAGE, TRANSPORTATION AND SUPPLY.

7-13.1. FLAMMABLE LIQUID. The term flammable liquid shall mean any oil or liquid that will generate a flammable vapor at a temperature below one hundred (100) degrees Fahrenheit when tested in a Tagliabue open cup tester.

7-13.2. STORAGE OF FLAMMABLE LIQUID FUEL. All flammable liquids that are commonly used as fuel for the generation of light, heat or power when stored above the ground surface shall be stored at least one hundred (100) feet from any opening to the underground or any building directly connected with such opening and at least three hundred (300) feet from any explosives magazine. Such liquids when stored in buried tanks shall be placed at least fifty (50) feet from any opening to the underground or any building directly connected with such opening and at least three hundred (300) feet from any explosives magazine.

7-13.3. STORAGE OF LUBRICATING AND OTHER COMBUSTIBLE OILS. Lubricating or other shall be stored at least fifty (50) feet from any opening to underground or from any building directly connected with such opening and at least three hundred (300) feet from any explosives magazine.

7-13.4. BARRIERS. All places used for the storage of flammable liquid fuel or lubricating or other combustible oils shall be so situated or so provided with barriers having enough capacity to hold the entire contents of liquid and prevent it from flowing to within one hundred (100) feet of any mine opening or three hundred (300) feet of any explosives magazine.

7-13.5. TANK VENTS. Tanks buried underground in which flammable liquids or lubricating oils are stored shall be properly vented.

7-13.6. STORAGE BUILDINGS. Buildings used for the storage of flammable liquids shall be used for no other purpose, and shall be clearly marked by signs identifying their contents. Such buildings shall be of fire resistive construction.

7-13.7. FLAMMABLE LIQUIDS UNDERGROUND. Flammable liquids shall not be stored underground in any mine, provided, however, that such flammable liquid, not exceeding one day's supply for each power unit, may be kept in a tank attached to the unit.

7-13.8. LUBRICATING OR OTHER COMBUSTIBLE OILS UNDERGROUND. Lubricating or other combustible oils, shall at no time exceed a six (6) days' supply underground except as may otherwise be permitted by the Commissioner. Such oils when stored underground, shall be stored in a fire-resistive structure.

7-13.9. TRANSPORTATION. In the transportation of flammable liquids, no person shall be permitted to ride on the skip or other conveyances with such liquids, except the person transporting same.

7-14. ELECTRICAL EQUIPMENT--GENERAL.

7-14.1. PERSONNEL. No person unless duly authorized by the superintendent shall be permitted to operate, install or handle any electrical conductors, machinery or equipment. Every such person so authorized shall be thoroughly familiar with the operation and maintenance of such electrical conductors, machinery and equipment, which he has been authorized to operate, install or handle and shall be capable of administering resuscitation after electrical shock and disengaging a person from contact with live conductors.

7-14.2. INSTALLATION AND MAINTENANCE. Every conductor and all equipment and machinery shall be so constructed, insulated, installed, and maintained as to safely carry without leakage or short circuit, the voltage applied thereto.

7-14.3. INSPECTION. All electrical conductors, machinery and equipment shall be periodically inspected. The period and extent of such inspection shall be determined by the Commissioner. A written record of all inspections shall be maintained at mine office and shall be subject to examination by the Commissioner.

7-14.4. RATING OF EQUIPMENT. All electrical equipment shall be rated in accordance with the current standards of the American Institute of Electrical Engineers and shall be operated within such rated capacity. Such rating shall be legibly posted on the equipment. The plate bearing such information shall indicate whether the rating is for continuance or intermittent service and shall be in accordance with the nameplate requirement of the American Institute of Electrical Engineers.

7-14.5. SIZE OF INSULATED CONDUCTORS. The size of all insulated conductors shall be in accordance with the standards as prescribed by the National Electrical Code for insulated conductors, as follows:

(See chart on next page)

ALLOWABLE CURRENT-CARRYING CAPACITIES OF CONDUCTORS IN AMPERES
NOT MORE THAN THREE CONDUCTORS IN RACEWAY OR CABLE
(From National Electrical Code, 1947) (Based on Room Temperature 30C. 85F.)

Size A.W.G. M.C.M.	Rubber Type R. Type R.W. Type R.U. (14-6) Thermoplastic Type T. (14-4/0) Type T.W. (14-4/0)	Rubber Type R.H.	Paper ----- Thermoplastic Asbestos Type T.A. ----- Var. Cam. Type V. ----- Asbestos Var. Cam. Type A.V.B.	Asbestos Var. Cam. Type A.V.A. Type A.V.L.	Impregnated Asbestos Type (14-8) Type A.I.A.	Asbestos Type A. (14-8) Type A.A.
14	15	15	25	30	30	30
12	20	20	30	35	40	45
10	30	30	40	45	50	55
8	40	45	50	60	65	70
6	55	65	70	80	85	95
4	70	85	90	105	115	120
3	80	100	105	120	130	145
2	95	115	120	135	145	165
1	110	130	140	160	170	190
0	125	150	155	190	200	225
00	145	175	185	215	230	250
000	165	200	210	245	265	285
0000	195	230	235	275	310	340
250	215	255	270	315	335	
300	240	285	300	345	380	
350	260	310	325	390	420	
400	280	335	360	420	450	
500	320	380	405	470	500	
600	355	420	455	525	545	
700	385	460	490	560	600	
750	400	475	500	580	620	
800	410	490	515	600	640	
900	435	520	555	...	...	
1000	455	545	585	680	730	
1250	495	590	645	...		
1500	520	625	700	785		
1750	545	650	735	...		
2000	560	665	775	840		
CORRECTION FACTOR FOR ROOM TEMPERATURE OVER 30°C. 86°F.						
°C. °F.						
40 104	.82	.88	.90	.94	.95	
45 113	.71	.82	.85	.90	.92	
50 122	.58	.75	.80	.87	.89	
55 131	.41	.67	.74	.83	.86	
90 194				.50	.61	.91
100 212					.51	.77
120 248						.69
140 284						.59

The above table is based on room temperature of 30ºC or 86ºF. For correction factors above 60C, see National Electrical Code. In no case shall

conductors be installed in such a way that copper temperatures exceed those given in the column headings. For 4 to 6 conductors current capacity if for single conductor in free air, See N.E.

7-14.6. EQUIPMENT ABOVE GROUND. INSTALLATION. All electrical equipment above ground shall be installed in accordance with the provisions of the National Electrical Code.

7-14.7. TRANSMISSION CONDUCTORS ABOVE GROUND. Overhead electrical transmission conductors between the generating station or substation and the mine entrance, shall be supported upon insulators, which shall be adequate in quality, size and design for the voltage transmitted. Where such conductor is more than five hundred (500) feet in length, lightning arresters shall be installed in connection there-with at the entrance to the mine. Such conductor, except in the case of trolley conductors shall be maintained not less than ten (10) feet above the ground at the lowest point, except at the point of entrance to the mine.

7-14-8. GROUNDING EQUIPMENT. The frames and bed plates of all motors, generators, transformers, compensators, rheostats installed underground, and all metallic coverings of electrical equipment and conductors including the neutral conductor of three or four conductor systems shall be effectively grounded; provided, however, that in the event installations were made prior to the effective date on these rules and regulations such installations as referred to herein may be exempted from the application of this rule at the discretion of the Commissioner of Labor for the State of Arkansas.

7-14.9. CONTINUITY OF COVERINGS FOR CONDUCTORS. All metallic coverings of conductors shall be electrically continuous.

7-14.10. PIPE LINES--RETURN RAIL BONDING. All underground metallic pipe lines one thousand (1000) feet in length or over, and all metallic pipe lines leading outside the mine shall be bonded to the return rail when they run parallel to trolley tracks, at the ends of the pipe line and at intervals not exceeding five hundred (500) feet.

7-14.11. RAIL RETURN BONDING. Tracks used as returns shall be bonded at every joint. Rails shall be cross bonded at intervals not exceeding two hundred (200) feet. Bonding shall be provided at all rail switches and frogs.

7-14.12. MAXIMUM VOLTAGE. The maximum primary voltage allowable underground shall not exceed four thousand five hundred (4500) volts.

The maximum voltage, allowable underground, used in the operation of electric locomotives shall not exceed two hundred seventy-five (275) volts.

The maximum voltage, allowable underground, used in the operation of loading equipment and other portable apparatus in new and replacement installations here-after made shall not exceed six hundred (600) volts.

7-14.13. CAPACITY OF CIRCUITS. All circuits shall be protected by automatic current interrupting devices which shall be sufficiently sensitive to operate on short-circuits without causing damage to the circuits.

7-14.14. UNARMORED CONDUCTORS. All unarmored shall be carried on insulators excepting conductors equipped with a type of insulation specifically designed to be used without insulators.

7-14.15. BURIED CONDUCTORS. Buried conductors shall be encased in a metal or fabricated covering. Such covering shall be reinforced in places where it is likely to be subject to injury.

7-14.16. JOINTS IN CONDUCTORS. All joints in conductors shall be mechanically and electrically efficient and shall either be soldered or shall be made by means of a mechanical device so designed as to assure a permanent joint.

7-14.17. PROTECTION OF JOINTS IN CONDUCTORS. Where conductors are joined, suitable junction boxes shall be used, or the joints shall be soldered, and the insulation, armoring, or lead covering, replaced in as good condition as it was originally.

7-14.18. CONDUCTOR FITTINGS. The point at which conductors enter oil filled appliances shall be provided with an oil-tight fitting.

The point at which an armored conductor enters a metal housing or metal structural member shall be provided with an insulating bushing.

The exposed ends of conductors at connection points shall be protected against moisture.

7-14.19. FUSES. All fuses shall be enclosed in a tight housing. Open type or link fuses shall not be used.

7-14.20. CAPACITY OF FUSES. The capacity of fuses used to protect feeder circuits shall not exceed one hundred twenty-five (125) percent of the safe capacity of such circuit. The capacity of all fuses shall be plainly indicated thereon.

7-14.21. PROTECTION OF REPAIRMEN. Persons making repairs to any live current carrying part of equipment shall be provided with and shall use rubber gloves or mats of suitable insulating material or both, if necessary.

7-14.22. PROTECTION OF OPERATORS. All places where persons are required to stand while operating any

switch or other electrical control appliances having terminals exposed to contact shall be so arranged as to provide free movement of such persons, shall be maintained dry and shall be provided with an insulating mat or platform.

7-14.23. PROTECTION OF EQUIPMENT. All electrical equipment, machinery and apparatus shall be installed with sufficient space to provide for the safe and efficient operation and manipulation of such equipment, machinery and apparatus.

7-14.24. PROTECTION OF TERMINALS. All exposed terminals on under-ground machines shall be protected with properly designed insulating covers of suitable material, or with metal covers connected to the earth.

7-14.25. LOCATION OF EQUIPMENT. All stationary machinery, controls, switches, transformers, and rheostats shall be so located or so protected as to prevent in jury thereto from falling or passing objects.

7-14.26. MOUNTINGS FOR CONTROL EQUIPMENT. All current control and all current measuring equipment and apparatus, except compensators for induction motors, shall be mounted on a base or bases of non-combustible insulating material.

7-14.27. FIRST AID SIGNS. Instructions in administering resuscitation after electric shock and disengaging a person from live conductors shall be conspicuously posted at the entrance to underground and to every generating station and every substation.

7-14.28. DANGER SIGNS. All machinery and equipment carrying in excess of two hundred (200) volts shall be clearly illuminated and conspicuously marked "DANGER" in letters at least three (3) inches high.

7-14.29. FIRE FIGHTING EQUIPMENT. Every place underground where electrical apparatus, equipment or machinery carrying a voltage in excess of five hundred (500) volts is installed shall be provided with at least one approved fire extinguisher or at least two (2) cubic feet of clean sand in red buckets. Such equipment shall at all times be maintained easily accessible and ready for use.

7-14.30. CONDUCTORS IN GASEOUS PLACES. No conductor other than trailing cables shall be used for the operation of acceptable equipment in places where acceptable equipment is required.

MOTORS AND GENERATORS--GENERAL PROVISIONS.

7-14.31. INDICATORS FOR GENERATORS. An ammeter or watt-meter shall be installed for each generator. One voltmeter shall be provided to serve all generators and shall be so connected that a reading may be made for each generator separately.

7-14.32. MOTOR CONNECTIONS. All connections to motors carrying more than three hundred (300) volts shall be guarded in order to prevent accidental contact there-with.

7-14.33. MOTORS -- CONTROLS, FUSE AND CIRCUIT BREAKERS. Every stationary motor and every portable motor underground, together with its starting device, shall be protected by a fuse on each phase, or in the case of motors of more than forty (40) horsepower, by a circuit-breaking device on direct current motors and on each phase of alternating current motors so that all phases are opened simultaneously and by switches arranged to cut off the power from the motor entirely. Such devices shall be installed in a convenient position near the motor and in sight of it.

7-14.34. MOTOR CIRCUIT FUSES. Motors of forty (40) horsepower or less shall be equipped with a fuse or circuit-breaker on each of two (2) phases of a three (3) phase alternating current motor, and on at least one (1) phase of a two (2) phase alternating motor.

SWITCHBOARDS.

7-14.35. FRAMES. The framework used for mounting switchboards shall be of iron or steel, or other incombustible material and non-current carrying parts shall be grounded.

7-14.36. FLOOR MATS. Floor mats of insulating material shall be provided on both sides of every switchboard. Such mats shall be of such size that a person cannot touch the equipment on the board while standing off the mat.

7-14.37. FLOORING. The flooring in front and in back of every switchboard carrying a voltage in excess of five hundred (500) volts, shall be of incombustible material.

7-14.38. ACCESS--REAR PASSAGEWAY. Access to the back of every switchboard carrying voltage of over three hundred (300) volts shall be barred by means of a substantial barrier so arranged that unauthorized persons cannot touch the equipment on the back of the panel. Entrance to such space shall at all times be kept locked except for the performance of work on the switchboard. Only authorized persons shall have access to such space for the performance of work therein. The gate or door lock shall be of a type which does not require the use of a key to unlock the gate or door from the inside for egress from such space. Access at both ends to such space shall be provided when the passageway is more than thirty (30) inches wide.

7-14.39. CONDUCTORS--REAR PASSAGEWAY. Conductors crossing the rear passageway shall be at least seven (7) feet above the floor level or shall be installed underneath the floor.

TRANSFORMERS.

7-14.40. TRANSFORMER ROOMS. Transformer rooms shall be lighted so that the intensity of light 30 inches above the floor shall be not less than five (5) foot candles while employees are required to be present. Such rooms shall be of fireproof construction and shall be kept locked against the entrance of unauthorized persons. Transformer rooms shall be so constructed as to retain oil from the transformers in case of leakage. Rooms constructed of metal or other conductive material shall be effectively grounded.

7-14.41. CURRENT INTERRUPTING DEVICES--GENERAL. All underground transformers shall be equipped with automatic current interrupting devices on the primary and secondary sides.

7-14.42. CURRENT INTERRUPTION AND CONTROL--OVER FIVE HUNDRED (500) VOLTS.

In circuits of over five hundred (500) volts entering or leaving underground transformers the current interrupting device shall consist of an oil-break switch in each conductor and each such switch shall be provided with an overload trip.

7-14.43. CIRCUITS ENTERING OR LEAVING ALL TRANSFORMERS. Circuits leaving the transformer shall be protected by a switch and an automatic circuit breaker to interrupt current, but fuses may be substituted for the circuit breakers in the case of lighting circuits, and in the case of power circuits transmitting sixty (60) kilowatts or less. Primary fuses and disconnecting switches shall be placed in the primary circuit ahead of the transformers, but in no case shall these disconnecting switches be opened or closed under load.

SWITCHES.

7-14.44. PROTECTION. All switches other than on switchboards referred to in rules 7-14.35. to 7-14.39. inclusive, shall be either so located or so housed as to protect them from dirt or moisture, and so as to guard persons from accidental contact with live parts thereof.

7-14.45. INSTALLATION. Switches shall be so installed that the handle is down when the current is "OFF" and so that the switch cannot be closed by gravity.

7-14.46. AIR-BREAK SWITCHES. Air-break switches used as disconnecting switches shall not be used to open circuits under load.

LAMP CORDS.

7-14.47. LAMP CORDS. The use of flexible lamp cord for any electrical purpose is prohibited, except for lighting connections for portable incandescent lights to be used in connection with the inspection and repair of machinery and equipment and on small portable electrical tools.

7-14.48. PROTECTION. Portable lights shall be protected by wire cages large enough to enclose both the lamp and the socket, and shall be provided with a nonconductive handle to which the light and socket shall be firmly attached and through which the cord carrying and the leading-in wires shall be carried.

TRAILING CABLES.

7-14.49. PLUGS. Where plugs are used for connection of electrical cords or cables the plug end shall be connected so that upon disconnection it shall be the dead-end of such cord or cable.

7-14.50. CONNECTIONS. The connection of trailing cables to motors shall be secure and the trailing cable shall be so secured to the frame of the machine as to protect the cable from injury and so as to eliminate any strain on the connection.

7-14.51. MAINTENANCE. Trailing cables shall at all times be maintained in a safe operating condition. After repair to such cables they shall be tested before being placed back in service.

WIRING IN SHAFTS, PASSAGEWAYS, Etc.

7-14.52. WIRING IN BORE HOLES. When telephone or signal wire is installed in the same bore hole with power conductors either the telephone and signal wires or the power conductors shall be incased in metal covering which shall be effectively grounded.

7-14.53. SUPPORTS. Conductors shall be securely fastened in place so that parallel conductors are at all times at least three (3) inches apart. Conductors used as returns shall be supported on insulators but need not be covered with

insulation.

7-14.54. PROTECTION OF CONDUCTORS. At all points in main roads where cars or the locomotive pass within 12 inches from conductors, such conductors when carrying in excess of 300 volts shall be substantially protected by means of guards, against injury. Conductors shall be adequately protected at all places where they are subject to injury from repair work or from blasting.

7-14.55. PROTECTION AND SUPPORTS FOR POWER CONDUCTORS IN SHAFTS--GENERAL. In all shafts, the angle of inclination of which is above 45 degrees from the horizontal, and in all hoisting shafts of manway compartments, all power conductors shall be amply protected by insulation and substantially fixed in position. All shaft conductors shall be supported on insulators that cannot cause abrasion of the covering or insulation, so spaced that no part of the conductor shall be under a tension greater than one-fourth of its ultimate strength. The conductor shall be held in position at points between the insulators by grips or cleats that cannot cause abrasion of the covering or insulation. Where the conductors are not completely boxed in and protected from falling material, space shall be left between them and the side of the shaft so that they may yield and lessen a blow from falling material. This rule shall not be construed to prevent the installation of efficiently insulated conductors in metal conduit, to transmit power underground.

CIRCUITS TO UNDER GROUND--PROTECTION AND SUPERVISION.

7-14.56. GENERAL PROVISION. All circuits carrying in excess of 300 volts and leading from generating stations and substations shall be provided with automatic current interrupting devices so arranged that the circuit will be automatically opened at its source if the current exceeds the cafe carrying capacity of the conductors.

7-14.57. CIRCUITS TO UNDERGROUND--SWITCHES AND CIRCUIT BREAKERS. Every power conductor carrying in excess of 300 volts leading underground shall be provided with a switch capable of opening the circuit under full load. Such switch shall be placed where the circuit enters underground or within 100 feet of such point except when the circuit is controlled by a separate switch or circuit breaker at the substation. The circuit breaker shall be so arranged that all underground conductors of the circuit shall be opened at the same time in case of an overload on one or more conductors.

7-14.58. TWO-WIRED D.C. CIRCUITS. Two-wire ungrounded direct current circuits shall be protected by an automatic circuit breaker or by a fuse and switch in each wire. Two-wire grounded direct current circuits shall be protected by a switch with an automatic circuit breaker or fuse in the ungrounded wire. When the circuit breaker trips free from the closing handle, the switch may be omitted.

7-14.59. THREE WIRE D. C. CIRCUITS. Three-wire direct current circuits shall be protected by a fuse or automatic circuit breaker in each outside conductor but no fuse or circuit breaker in the neutral conductor. The fuses or circuit breakers in such circuits shall be isolated from live sources by means of a triple pole switch.

7-14.60. THREE-PHASE A. C. CIRCUITS. Three-phase delta or "Y" connected alternating current circuits shall be protected by a fuse or an automatic circuit breaker in each ungrounded wire. The automatic circuit breakers shall be so arranged that the opening of the one phase will open the other phases. Switches shall be provided to isolate the fuses or circuit breakers from live sources.

7-14.61. OVERHEAD CONDUCTORS ABOVE GROUND--LIGHTING ARRESTERS. Overhead transmission conductors between the generating station or substation and the mine entrance, shall be supported upon insulators, which shall be adequate in quality, size and design for the voltage transmitted. Where such conductor is more than 500 feet in length, lightning arresters shall be installed in connection therewith at the entrance to the mine. Such conductor, except in the case of trolley conductors, shall be maintained not less than 10 feet above the ground at the lowest point, except at the point of entrance to the mine.

7-14.62. LIGHTNING ARRESTERS--TRANSFORMERS. Lightning arresters shall be connected to the secondary side of the transformers which feed circuits leading underground unless the portion of the secondary circuit above ground is less than 50 feet long in which case the arrester may be connected to the primary side of the transformer.

LIGHTNING SYSTEMS.

7-14.63. SIZE OF CONDUCTORS. Conductors used in lighting circuits shall be not less in size than No. 14 A.W.G.

7-14.64. LAMP SOCKETS. The exterior of all lamp sockets shall be of non-metallic material and all sockets shall be of the weatherproof type.

7-14.65. LOCATION OF LAMPS. A clear space shall be provided around all electric lamps. Electric lamps shall be so placed that they cannot come in contact with combustible material.

POWER CIRCUITS.

7-14.66. LOCATION OF CONDUCTORS. All power conductors shall be installed not less than six inches from trolley conductors.

7-14.67. SECTIONALIZING. All power circuits shall be sectionalized with switches which shall be locked when in open position.

7-14.68. BRANCH CIRCUITS. Branch power circuits shall be provided with a cut-off switch at or near the point where they join the main circuit.

TROLLEY CIRCUITS.

7-14.69. SUPPORTS. Trolley conductors shall be so supported on straight runs that the sag between any two supports does not exceed three (3) inches. On curves, the trolley conductors shall be so supported that any one support may be released without exposing the locomotive operator to the danger of contact. All trolley conductor supports or hangers shall be efficiently insulated.

7-14.70. SECTIONALIZING. Trolley circuits shall be sectionalized with switches spaced at intervals not to exceed 2500 feet, unless otherwise authorized by the Commissioner.

7-14.71. SECTIONAL SWITCHES AND FROGS. Sectional switches shall be provided with locks and shall be locked when in open position. Every branch circuit shall be provided with a frog and a sectional switch near the frog so arranged that the branch circuit can be cut off.

7-14.72. PROTECTION OF TROLLEY CONDUCTORS. At all places where men are required to work or pass regularly under trolley or other bare power conductors which are placed less than seven feet above top of rail, a suitable protection shall be provided, which may consist of channeling the roof or of placing boards along the conductor which shall extend three inches below it or in the use of any other device that will afford ample protection. At all points where timbers or tools have to be unloaded or transferred up a raise, the trolley conductor shall be boxed, shall be well lighted with electric lamps.

All trolley conductors that are within seven feet of ladders, chute gates or platforms, and where timbers and tools are unloaded, shall be guarded against accidental contact.

SIGNAL AND TELEPHONE CIRCUITS.

7-14.73. LOCATION. Underground battery signal circuits and telephone wires shall be installed remote from any power conductors.

7-14.74. PROTECTION. Where signal or telephone circuits cross a haulage road the conductors shall be insulated and boxed or carried in rigid conduit.

7-14.75. VOLTAGE. The voltage in any bare conductor signal systems shall not exceed 50 volts at any point in the systems.

7-15. HOISTING.

7-15.1. PERSONNEL. Hoisting engines shall at all times be in charge of and operated by an experienced hoisting engineer who shall be familiar with the details and working of a hoisting engine. Such hoisting engineers shall be selected and appointed by the superintendent. No person other than a duly appointed hoisting engineer shall be permitted to operate a hoisting engine.

EXCEPTION 1-- EMERGENCY: In case of emergency a hoisting engine may be operated by anyone familiar with the hoist controls and signals.

EXCEPTION 2-- APPRENTICES: Hoisting engineer's apprentices shall be duly appointed by the superintendent. The operation of a hoisting engine by such apprentice shall be under supervision and in the presence of a hoisting engineer, subject, however, to such restrictions as the superintendent may impose.

7-15.2. LITERACY OF HOISTING ENGINEERS. Hoisting engineers shall be able to readily speak and read the English Language.

7-15.3. AGE. Hoisting engineers in charge of hoists on which persons are permitted to ride shall be at least 18 years of age.

Hoisting engineers in charge of hoists used solely for transportation of material shall be at least 16 years of age.

7-15.4. NUMBER OF HOISTING OPERATORS. At every shaft in which 50 or more men per shift are to be raised or lowered at the beginning of a shift, there shall be stationed with the hoisting engineer an extra man competent to

operate the hoisting engine, except:

1. Where the hoisting controls are of the less constant hand pressure design and are so arranged as to automatically cut off the power when the hand pressure is released from the controls or,

2. Where the hoisting engine is equipped with automatic speed control and automatic limit stops.

7-15.5. CHANGE OF PERSONNEL. The operation of a hoisting engine shall not be transferred from one person to another while the hoist is in motion, except in an emergency.

7-15.6. ENTERING ENGINE ROOM. No person other than a hoisting engineer shall enter the engine room unless authorized by the superintendent to do so. The Hoisting engineer shall be responsible for the observance of this provision.

7-15.7. CONVERSATION. The hoisting engineer shall hold no conversation while operating the hoisting engine.

7-15.8. SPEED--GENERAL. The maximum allowable rate of speed of hoists when transporting persons shall be established by the superintendent. No hoist shall be operated in excess of such established speeds.

7-15.9. SPEED OF BUCKETS. When conveying men in a bucket its speed shall at no time exceed 500 feet per minute, except in the case of apprehended danger and shall be reduced to 200 feet per minute or less, when the bucket is within 100 feet of any stop.

7-15.10. NOTICE. Notice of maximum allowable speeds shall be conspicuously posted near the hoisting engine.

All maximum allowable speeds, established under these rules shall be subject to revision by the Commissioner.

7-15.11. WHEEL BLOCKS--HOISTWAY ENTRANCE. The track entrance to every hoist cage used for raising or lowering vehicles, commonly known as caging cars, shall be provided with a track dog or wheel block which shall prevent the entrance of the vehicle into the shaftway unless such obstacle is removed. Such track dog or wheel block shall be so designed and so installed that it must be held by manual pressure to permit the passage of the vehicle and will automatically resume its blocking position by gravity when released. Such device shall be installed not less than 10 feet and not more than 20 feet from the hoist way line.

7-15.12. CAPACITY--NUMBER OF MEN. The superintendent shall determine the maximum allowable number of men that may safely ride on each hoisting conveyance at one time. Such capacity shall be conspicuously posted at every entrance to such conveyance. The posted capacity shall at no time be exceeded, but shall be subject to revision by the Commissioner.

7-15.13. CAPACITY--DOUBLE HOISTS. In installations where two hoisting conveyances counter balance one another the hoisting machine shall have sufficient capacity to safely hoist one such unbalanced conveyance when carrying the maximum allowable number of men which may lawfully be carried thereon.

7-15.14. LOADING. At the beginning and end of every shift, a person shall be stationed at every level of every shaft where the men enter upon the hoisting conveyance. Such person shall remain at such station until the last man of the shift has entered the conveyance. Such person shall be duly appointed by the superintendent and shall supervise the loading of the conveyance.

7-15.15. CAGE-MEN. At times other than the regular change of shift when men are raised or lowered by cage or other conveyance, except a bucket, such cage or other conveyance shall be operated under the charge of a person appointed as a cage-man or starter, and no person other than such cage-man or starter shall give any signal for the movement of the cage or other conveyance. The cage-man or starter shall not be required when the cage is used for supplies only. Such cage-man or starter shall be duly appointed by the superintendent.

In the event an employer or any other interested person produces sufficient evidence to the Commissioner of Labor for the State of Arkansas, to sustain the fact that the application is unnecessary due to particular circumstances, the Commissioner of Labor may exempt the employer or any other interested party from the application of this rule.

7-15.16. LIMIT OF TRAVEL. Every hoist shall be provided with a device which shall prevent the motion of the conveyance beyond its uppermost safe limit of travel.

7-15.17. WARNING SIGNALS. Every hoist on which 50 or more men are hoisted per shift shall be equipped with a device which shall sound a warning signal in the engine room when the conveyance is ascending passes a point to less than 60 feet nor more than 100 feet from the upper limit of travel of the conveyance, unless the hoisting engine is equipped with an automatic overwind and speed control device.

7-15.18. INSPECTION. A hoisting engineer or other qualified person appointed by the superintendent shall inspect all hoisting machinery and all devices and appliances connected therewith, daily, and shall immediately report to the superintendent any defect found therein.

7-15.19. After completing repairs to a hoist, or after being out of service for any other reason the hoist shall be operated through one complete cycle of operation before any person is permitted to ride thereon. No hoisting shall be done in any

shaft in which repairs are being made.

7-15.20. HOISTING ROPE. All rope used for hoisting persons by means of mechanica1 power shall be wire ropes.

7-15.21. FACTOR OF SAFETY OF HOISTING ROPE. The factor of safety of all hoisting rope on all hoist installations heretofore made shall in no case be less than five when hoisting men. The factor of safety based on static loads for such hoisting rope on all hoist installations hereafter made shall be not less than the values given in Fig. 1. when hoisting men. (See graph.)

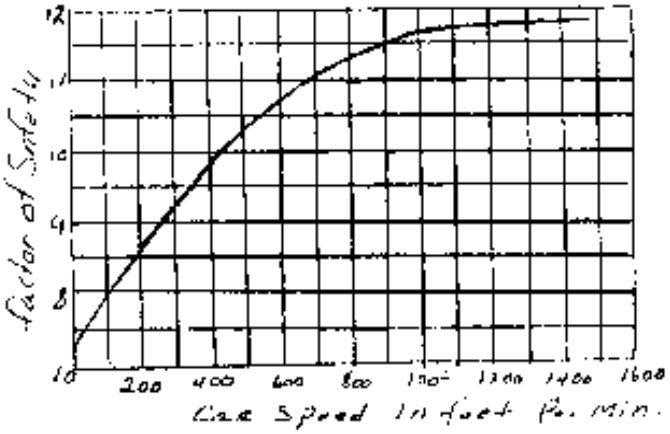

Fig. 1. Factors of Safety for Hoisting Rope for Power Passenger Hoists.

7-15.22. SHEAVES. The head or angle sheave shall have a minimum diameter in compliance with manufacturers recommendations as to size and type of rope used, subject to approval by the Commissioner.

7-15.23. WEAR. When more than 10 percent of the original number of wires are broken within any 10 consecutive feet of length of rope or when the wires on the crown of a strand are worn to 60 percent of their original cross sectional area the use of the rope for hoisting or lowering purpose shall be discontinued. Sheaves that have worn through at any point shall be replaced.

7-15.24. ROPE-- PREVENTION OF CORROSION AND PRESERVATION OF CORE. Wire rope used in hoisting or lowering men shall at all times be maintained in a properly lubricated condition. The lubrication shall be such as to reduce the rubbing against each other of the wires and strands, prevent decay of the rope core and prevent rusting and pitting of the rope.

7-15.25. SPLICING. Wire rope used in hoisting or lowering men shall not be spliced for the purpose of repair or increasing its length but shall be replaced by a new rope, containing no splice, except to secure the ends to the drum or hoist respectively.

7-15.26. INSPECTION OF ROPES. Wire rope shall be regularly inspected at least once every week by a qualified person authorized by the superintendent.

7-15.27. LENGTH OF ROPE. All hoisting rope shall be of such length that at least two full turns shall at all times remain on the drum or reel.

7-15.28. ROPE FASTENINGS. All hoisting ropes shall be securely fastened at both ends. The wire rope shall be secured to the conveyance by means of at tapered babbitted socket or a proper size pear-shaped thimble. If a rope thimble is used the rope shall be secured by means of at least three rope clamps.

The winding drum end of a rope shall be secured by at least three clamps on the inside of the drum or by a tapered babbitted socket.

7-15.29. CAGE CONSTRUCTION. Every hoisting cage for conveying persons in a shaft having an inclination of more than 45 degrees from the horizontal, shall be covered with a metal bonnet.

In all shafts having an inclination of 80 degrees or more from the horizontal, the bonnet shall consist of two hinged leaves of at least three-sixteenths inch plate and shall slope toward each side. It shall be so arranged as to open upward.

The sides of the cage shall be enclosed with metal plate or wire screen having a mesh of not more than two inches and the size of the wire shall be not less than number 8. U.S. standard gauge.

The cage shall be provided with either a hinged gate swinging inward or a sliding gate.

7-15.30. CAGE GATE. When persons ride on the cage, the gate shall be closed at all times while the cage is in motion.

7-15.31. AUTOMATIC BRAKES. Every machine used for hoisting and lowering men shall be provided with a brake so arranged as to automatically stop and hold the cage when the hoist power fails, or when the cage passes the top terminal.

7-15.32. CAGE SAFTIES. Every hoist used for conveying persons in a shaft having an inclination of 80 degrees or more from the horizontal shall be provided with a device that will automatically operate to prevent the conveyance from dropping when the cable breaks or becomes slack. Such device shall be of sufficient strength to hold the conveyance while carrying the maximum allowable load and shall be tested at least once every month.

7-15.33. HOISTING MATERIALS. No person shall rise upon any conveyance that is loaded with tools, timbers or other materials or equipment, except such person as is necessary for unloading the conveyance. In such case signals shall be given to indicate to the hoisting engineer the presence of a person on the conveyance. Every object placed on a hoisting conveyance shall be so placed thereon and so secured or lashed that no part thereof shall protrude or move beyond the outer rim of the conveyance, except that tools, timber or other materials may be permitted to protrude above the top of the conveyance provided they are securely fastened to the hoist rope or to the upper part of the conveyance.

Every object shall be so secured or located as to prevent its movement beyond the confines of the conveyance due to vibration or other cause.

7-15.34. SHAFT SINKING. In lowering any conveyance in a shaft in which men are working it shall be stopped at least 15 feet above such men and shall proceed only upon signal by one of such men to the hoisting engineer.

During the vertical shaft-sinking operations, no other work in any other place in the same shaft shall be performed, nor shall any material or tools be hoisted or lowered from or to any other place in such shaft while men are at work in the bottom of the shaft, unless the men so at work be protected from the danger of falling material by a securely constructed covering extending over the whole area of the shaft, sufficient closeable openings being left in the covering for the passage of men and the bucket or other conveyance used in the sinking operations, or by a substantial rock pentice. Hoisting buckets shall be made secure by means of self-locking hooks.

7-15.35. WHIMS. Whims shall be equipped with a latch or locking device that shall lock the conveyance in place while in stop position.

7-15.36. SHAFTWAY GATES. Every shaftway landing in a hoisting shaft used for hoisting persons shall be provided with a gate. Such gate shall be substantially constructed and openings therein shall be not more than two inches in least dimension and it shall extend from a point not more than two inches above the floor to a height of at least 42 inches.

7-16. SIGNAL SYSTEMS.

7-16.1. NUMBER AND TYPES OF SIGNAL SYSTEMS--SIGNAL STATIONS. Every mine shall be equipped with an efficient means of interchanging distinct and definite signals between the top of the shaft and the lowest level and the various intermediate levels from which men or materials are raised or lowered. A signal station shall be located at each such level, which shall be in direct communication with the hoisting control room.

There shall be provided and maintained two separate systems of signaling which shall be either electrical, pneumatic, or mechanical, or one such system supplemented by a speak tube or a telephone system. At least one of the systems shall have a sounding device.

7-16.2. SIGNALING--WHEN REQUIRED. No person shall ride upon any bucket, cage, skip or other conveyance unless proper signals have been given as prescribed in these rules.

No person shall knowingly interfere with or impede a signal, or damage a signal system, or give or cause to be given a wrong signal.

7-16.3. SIGNALMAN. No person other than one duly authorized by the superintendent shall transmit hoisting signals.

7-16.4. TRANSMISSION OF SIGNALS. When hoisting men the signal shall be transmitted from the landing to the hoisting engineer. It shall be acknowledged by the hoisting engineer. The hoisting cage, skip, bucket or other conveyance shall not be moved from any level or landing unless the starting signal is given directly from such point to the operator of the hoist.

7-16.5. POSTING OF CODE. The signal code shall be permanently and conspicuously posted at every landing or

level of the hoistway and in the hoisting engine and control room. Such posting shall be in letters at least one-half inch high and on a fixed wood or metal hoard at least 18 x 18 inches.

7-16.6. SIGNAL CODE. The following code shall be used on all hoists:

1 bell---Stop, if in motion, or hoist if not in motion.
2 bells--Lower.
3 bells--caution, run carefully, men on.

Additional signals to meet local conditions may be established and used, provided they are easily distinguishable and do not conflict with the above code.

7-16.7. EMERGENCY SIGNALS. The electric lighting system shall be so arranged that flash signals may be given on the general lighting circuit. In case of fire, flood or other major danger, nine flashes shall be given on the lighting circuit.

7-17. HAULAGE AND HANDLING EQUIPMENT.

MUCK TRAINS.

7-17.1. OPERATIONS OF LOCOMOTIVES. All locomotives shall be operated exclusively by a competent and qualified motorman, who shall be selected and appointed by the superintendent.

7-17.2. RIDING AND COUPLING MOVING VEHICLES. Alighting from or boarding moving vehicles or coupling or uncoupling moving cars is prohibited.

No person shall ride or be permitted to ride on top of or between loaded cars.

7-17.3. TRIMMING LOADS. The material on loaded cars shall be so trimmed as to prevent dislodgement of material in transit.

7-17.4. SPEED. The maximum speed of mechanical haulage shall be determined by the superintendent, but at no time shall such speed exceed 15 miles per hour underground or three miles per hour when within 50 feet of a stopping point. Mechanical haulage speeds in excess of the above may be employed when authorized by the Commissioner.

7-17.5. POSTING SPEEDS. The maximum speed of haulage within each zone as determined by the superintendent shall be conspicuously posted at the entrance of such zone.

The maximum speed as determined by the superintendent shall be subject to revision by the Commissioner.

7-17.6. SOUNDING DEVICES. Every locomotive shall be equipped with a sounding device. A warning signal shall be sounded at frequent intervals while the locomotive is in motion underground.

7-17.7. STOPPING AND HOLDING DEVICES. Automatic stop blocks or derailing devices shall be provided at the top of every slope or incline, where cars are raised or lowered. A holding device shall be provided for cars used on inclines. Such device shall be set in holding position while loading.

7-17.8. WIRING OF LOCOMOTIVES. Locomotive wiring between compartments, if any, shall be installed in rigid metallic conduit or flexible hose conduit.

7-17.9. HEAD LIGHTS. Head lights shall be provided on both ends of every locomotive. Reflectors or lamps shall be installed on the front and rear end of every train and shall be protected against injury.

7-17.10. OPERATION. No cars shall be pushed ahead of the locomotive, where it is practical to draw.

7-17.11. TROLLEYS. All trolleys shall be trailed.

7-17.12. OPERATORS. The operator of every locomotive shall be at least 18 years of age.

7-17.13. INTERNAL COMBUSTION ENGINES. The use of internal combustion engines for underground haulage shall be subject to approval by the Commissioner.

7-17.14. SIGNALING. During coupling or uncoupling operations no person other than the one charged with the duty of coupling or uncoupling cars shall transmit signals to the operator of the locomotive.

7-17.15. COUPLING OPERATIONS. During coupling or uncoupling operations the person performing such operations shall stand clear of the cars until they have come to rest.

7-17.16. WALL CLEARANCE AND SHELTERS. Every passageway used for mechanical haulage shall be of sufficient width to provide a clearance on one side of at least two feet six inches between the cars and the wall of the passageway where practicable. Where it is impracticable to provide such clearance, shelters shall be provided in the wall of the passageway at intervals not exceeding 60 feet. Such shelters shall be at least eight (8) feet long measured along the wall, four feet (4) wide and five (5) feet high. Such shelters shall at all times be kept clear and shall be painted white.

7-17.17. CAR CLEARANCE. The clearance between cars on parallel tracks shall be not less than three (3) feet. Where such clearance cannot be provided, the haulage speed shall not exceed three (3) miles per hour.

7-17.18. MAN CARS. Cars used for the conveyance of workmen shall be equipped with hand holds, hand grips or other similar devices to protect the person riding thereon from being thrown in case of a sudden start or stop.
7-17.19. HAULAGE HEADING. The roof shall be taken down in all haulage heading to a sufficient height to permit the locomotive operator to sit erect without danger of striking his head while operating the locomotive. The distance of travel of locomotives under low roof rooms and headings shall not exceed three hundred (300) feet.
7-17.20. SHUTTLE CAR HAULAGE WAYS. All shuttle car haulage in excess of four hundred (400) feet shall have a minimum height of forty eight (48) inches.
MATERIAL HANDLING AND CONCRETING EQUIPMENT.
7-17.21. PROTECTION OF HOPPERS. Every material hopper shall be so located, covered or otherwise protected as to prevent the fall of persons into the hopper.
7-17.22. STAIRS AND LADDERS--CAR HANDLING EQUIPMENT, DRILL CARRIAGES, etc.
Stairs or fixed ladders shall be provided for mounting drill carriages, car handling equipment or any other portable structure or temporary platform underground. Such stairs and ladders shall at all times be maintained in a safe condition.

7-18. DRILLING.
7-18.1. LIMITATIONS. No stopping shall be done within 20 feet of any shaft used for hoisting men or material.
7-18.2. BOUNDARIES. No stopping shall be done within 10 feet of the boundary line of a mine property except on application to and permission granted by the Commissioner.
7-18.3. APPROACHING WATER HAZARD. When approaching toward a mine excavation that is suspected of being filled with water, the working place shall not exceed six feet by eight feet (6x8 feet) in cross section, and the bore holes shall be kept at least 15 feet in advance of the face.
7-18.4. WATER HAZARD. Where a water hazard exists laterally from the course of the drive enough lateral borings shall be made at least 15 feet deep to insure the workmen against such hazard.

Where such hazard exists safe means of escape shall be provided for all persons who may be subject to such hazard.

7-19. SUPPORTS--TIMBERING.
7-19.1. GENERAL. Every excavation and every working place where timbering is necessary shall be securely and adequately supported to prevent injury to any person from falling material. Otherwise, it shall be securely closed to the passage of persons.
7-19.2. SUPPLY OF TIMBERING. It shall be the duty of the operator to see that all miners in the mine are supplied at all times with such timbers as are necessary to keep their working places in a safe condition, such timbers to be supplied at a point readily accessible and convenient to the working place.

If for any reason, necessary timbers cannot be supplied to any miner when required, it shall be the duty of the mine foreman to instruct the miner or miners to vacate all such working places until supplied with the timbers needed, but nothing contained herein shall be construed to relieve the operator of the duty of supplying such timbers.
7-19.3. MAINTENANCE. All timbering material in all shafts and all passageways shall be kept cleaned of any dangerously loose rock.
7-19.4. FIRE PROTECTION. Heavily timbered stopes shall be subject to a thorough fire inspection by the foreman or other person designated by the superintendent immediately after every shift leaves the stope.

TNT-Iron Oxide	Insensitive Powder Test (See Rule 7-12.7.)

TNT--REFINED TNT. Melting point not less than 80°C. Moisture content less than 0.1 percent.
IRON OXIDE--Red iron oxide containing 95 percent to 98 percent $Fe_2 O_2$ within a yellowish tone on reduction. Moisture content less than 0.1 percent.

PREPARING INSENSITIVE POWDER.--Before mixing, the ingredients are sieved through a 30 mesh screen to remove lump and coarse particles. For mixing, the desired proportion of each ingredient is weighed and they are sieved together through a 30 mesh screen 10 times. Sufficient mixture of a given ration of TNT and iron oxide should be prepared in one batch to test all the caps which are to be fired in that mixture. The mixed powder is tamped uniformly by hand into one and one-fourth inch by four inch paraffin-sprayed shells to a density such that the finished cartridges weigh approximately 70 grams each.

TESTING PROCEDURE. In carrying out the test, a cap is inserted in the hand-crimped end of the cartridge as in priming a stick of dynamite. Blasting caps are inserted so that the top of the shell is even with the end of the cartridge, while electric blasting caps are embedded in the powder up to the bead. The assembly of cartridge and cap is fired in a vertical position. If the insensitive powder completely detonates, there is no residue; but if it fails, a stub or butt crimp of the cartridge remains after the shot.

INTERPRETATION OF RESULTS. Iron oxide desensitizes TNT, and the greater proportion iron oxide in that mixture, the less sensitive that mixture becomes, and the stronger must be a cap in order to detonate the mixture. A comparison of the strength of caps is therefore possible by determining the percentage of detonations and failures with a given insensitive mixture or by comparing the caps with several insensitive mixtures of varying degrees of sensitiveness.